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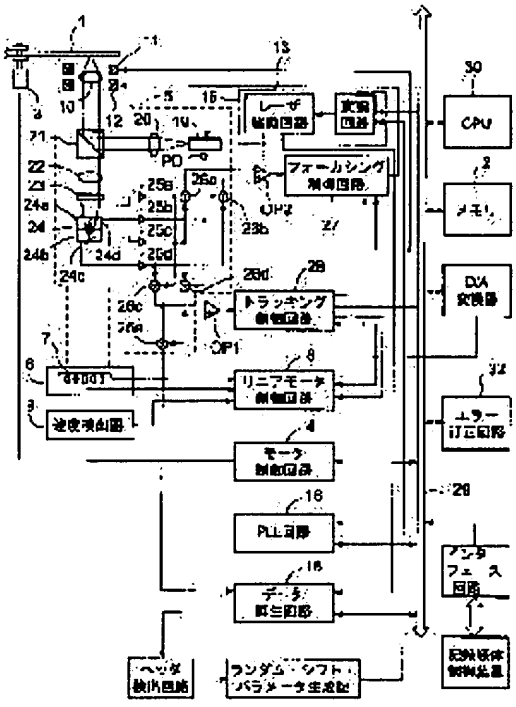
(54) NOISE ELIMINATION CIRCUIT FOR SINGLE OUTPUT RF SIGNAL

(57)Abstract:

PROBLEM TO BE SOLVED: To eliminate noise intruding into an RF signal provided from a pickup of an optical disk unit.

SOLUTION: A reference voltage Vref of a single output amplifier 26e of the pickup 5 is considered as a signal and supplied to a reference voltage input of a differential amplifier 44 in a fixed part through a flexible cable 41. A signal line 54 for transmitting the RF signal and a signal line 55 for transmitting the above reference voltage are wired close to each other. The reference potential is thereby put in order. Although the noises Ea, Eb, Ec are intruded into both signal lines 54 and 55, these noised are negated each other since they are inputted to the differential amplifier 44 with the same phase.



LEGAL STATUS

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CLAIMS

[Claim(s)]
[Claim 1] The single output amplifier which amplifies the signal read from the disk-like record medium, and outputs a RF signal, The pickup which has the reference electrical-potential-difference generating section which generates the reference electrical potential difference of said single output amplifier from supply voltage, and offers said reference electrical potential difference and said RF signal, The flexible cable which transmits the RF signal and reference electrical potential difference which are offered from said pickup, The fixed part which has the differential amplifier which amplifies the difference of the RF signal transmitted by said flexible cable and a reference electrical potential difference is provided. The disk-like record-medium regenerative apparatus characterized by for the signal line which transmits said RF signal, and the signal line which transmits said reference electrical potential difference approaching, and wiring.
[Claim 2] The single output amplifier which amplifies the signal read from the disk-like record medium on the basis of a reference electrical potential difference, and outputs a RF signal, The pickup which has the reference electrical-potential-difference offer section which offers the reference electrical potential difference of said single output amplifier as a reference voltage signal, and offers said RF signal and said reference voltage signal, The flexible cable which transmits the RF signal and reference voltage signal which are offered from said pickup, The differential amplifier which amplifies the difference of the RF signal transmitted by said flexible cable, and a reference voltage signal, The reference electrical-potential-difference generating section with which generates said reference electrical potential difference and said pickup is provided through said flexible cable The fixed part which it has is provided. The disk-like record-medium regenerative apparatus characterized by for the signal line which transmits said RF signal, and the signal line which transmits said reference voltage signal approaching, and wiring.
[Claim 3] The single output amplifier which amplifies the signal read from the disk-like record medium on the basis of a reference electrical potential difference, and outputs a RF signal, The pickup which has the GND potential signal offer section which offers the GND potential of said single output amplifier as a signal, and offers said RF signal and said GND potential signal, The flexible cable which transmits the RF signal and GND potential signal which are offered from said pickup, The differential amplifier which amplifies the difference of the RF signal transmitted by said flexible cable, and a GND potential signal, The fixed part which has the reference electrical-potential-difference generating section with which generates said reference electrical potential difference and said single output amplifier is provided through said flexible cable is provided. The disk-like record-medium regenerative apparatus characterized by for the signal line which transmits said RF signal, and the signal line which transmits said GND potential signal approaching, and wiring.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the circuit which improves the S/N ratio of the RF signal which especially read information from the optical disk about the equipment which carries out record playback to information record media, such as an optical disk.
[0002]
[Description of the Prior Art] Drawing 5 shows the connection configuration of RF signal input part prepared on the PCB substrate fixed to the RF signal output part [of the pickup 40 in the conventional optical disk unit], and body side. RF signal output part of pickup 40 and RF signal input part of a fixed part 42 which are moving part are connected by the flexible cable 41.
[0003] A power source (PS) 46 is formed in a fixed part side, and supplies the supply voltage Vcc of 5V to each circuit of a fixed part 42 through the circuit pattern on PCB. This supply voltage Vcc is supplied also to the circuit of moving part through the flexible cable 41. Amplifier 45 generates the reference electrical potential difference Vref of 2.1V from supply voltage Vcc, and this reference electrical potential difference Vref is supplied also to a moving-part side through a fixed part side and the flexible cable 41.
[0004] After the RF signal by which reading appearance was carried out from the optical disk is amplified with the single output amplifier 43 of pickup 40, it is inputted into the differential amplifier 44 of a fixed part 42 through the flexible cable 41 and a PCB substrate. Thus, when the RF signal outputted from pickup 40 is the output of the single output amplifier 43, a RF signal is outputted on the basis of the reference electrical potential difference Vref1 of amplifier 43. On the other hand, the RF signal inputted into the differential amplifier 44 of a fixed part 42 is amplified on the basis of the reference electrical potential difference Vref.
[0005]
[Problem(s) to be Solved by the Invention] Since the circuitry by which the RF signal of pickup 40 is outputted from the single output amplifier 43, and is amplified with the differential amplifier by the side of a fixed part in an electronic circuitry with the long transmission line like drawing 5 on the basis of the reference electrical potential difference Vref of a fixed part 42 has an impedance in the transmission line, it produces fluctuation on a reference electrical potential difference. This fluctuation is not desirable to a signal transmission. Moreover, it is weak in the noise mixed from the outside, and a high S/N ratio cannot be attained. This reason is supplied to the various circuit in pickup, and Noise Ea mixes the reference electrical potential difference Vref1 of the 1st pickup 40 from that supply path. This noise Ea is outputted together with the signal output VRF through amplifier 43. Since the flexible cable 41 which tells [2nd] a signal from pickup 40 to a fixed part is comparatively long, Noise Eb tends to jump into the signal line in this flexible cable. In case the RF signal inputted [3rd] into the fixed part 42 inputs into the differential amplifier 44 through the circuit pattern prepared on the PCB substrate, Noise Ec mixes also in a circuit pattern. Thus, the mixed noise is inputted into the differential amplifier 44 on the basis of the reference electrical potential difference Vref of a fixed part. Consequently, the output of

the differential amplifier 44 will be set to A (VRF+Ea+Eb+Ec) if that amplification factor is set to A. Therefore, compared with a differential output and a difference input configuration, the circuit of a single output and a difference input configuration cannot take a high S/N ratio.
[0006] Since it corresponds to the improvement in the reading engine performance, and high ****-ization, improvement in the S/N ratio of a RF signal is important. Therefore, the object of this invention aims at removing the noise mixed in a RF signal.
[0007]
[Means for Solving the Problem] In order to attain the above-mentioned object the disk-like record-medium regenerative apparatus of this invention It has the reference electrical-potential-difference generating section which generates the reference electrical potential difference of said single output amplifier from the single output amplifier which amplifies the signal read from the disk-like record medium, and outputs a RF signal, and supply voltage. The pickup which offers said reference electrical potential difference and said RF signal, The flexible cable which transmits the RF signal and reference electrical potential difference which are offered from said pickup, The fixed part which has the differential amplifier which amplifies the difference of the RF signal transmitted by this flexible cable and a reference electrical potential difference is provided, and the signal line which transmits said RF signal, and the signal line which transmits said reference electrical potential difference approach, and is wired.
[0008] Thus, the reference electrical potential difference of an input and an output can be arranged by transmitting a reference electrical potential difference as a signal. Moreover, since the signal line which transmits said RF signal, and the signal line which transmits said reference electrical potential difference approach and is wired, a noise mixes in both signal lines similarly. Since such a noise is in phase to the differential amplifier and is inputted into it, it negates each other.
[0009]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail, referring to a drawing.
[0010] Drawing 1 is the block diagram showing the configuration of the optical disk unit with which this invention is applied. An optical disk 1 rotates, for example with a fixed linear velocity by the motor 3. Record of the information over an optical disk 1 and playback are performed by the optical pickup 5. The optical pickup 5 is being fixed to the drive coil 7 which constitutes the moving part of a linear motor 6, and this drive coil 7 is controlled by the linear motor control circuit 8.
[0011] The rate detector 9 is connected to the linear motor control circuit 8, and the speed signal of the optical pickup 5 detected in this rate detector 9 is sent to the linear motor control circuit 8. The permanent magnet which is not illustrated is prepared in the fixed part of a linear motor 6, and when the above-mentioned drive coil 7 is excited by the linear motor control circuit 8, an optical pickup 5 is moved to radial [of an optical disk 1].
[0012] The objective lens 10 supported by the wire or flat spring which is not illustrated is formed in an optical pickup 5. Migration in the direction of focusing (the direction of an optical axis of a lens) is possible for this objective lens 10 by actuation of a drive coil 11, and migration in the direction of tracking (direction which intersects perpendicularly with the optical axis of a lens) is possible for it by actuation of a drive coil 12.
[0013] A light beam is emitted from the semiconductor laser oscillator 9 by actuation control of the laser control circuit 13. The light beam emitted from the semiconductor laser oscillator 19 is irradiated on an optical disk 1 through a collimator lens 20, the half prism 21, and an objective lens 10. The reflected light from an optical disk 1 is led to a photodetector 24 through an objective lens 10, the half prism 21, a condenser lens 22, and a cylindrical lens 23.
[0014] A photodetector 24 consists of the photodetection cels 24a, 24b, 24c, and 24d of quadrisection. Among these, the output signal of photodetection cel 24a is supplied to the end of adder 26a through amplifier 25a a current / for electrical-potential-difference conversion. The output signal of photodetection cel 24b is supplied to the end of adder 26b through amplifier 25b. The output signal of photodetection cel 24c is supplied to the other end of adder 26a through amplifier 25c. A photodetection

cel 24d output signal is supplied to the other end of adder 26b through amplifier 25d.
[0015] Furthermore, the output signal of photodetection cel 24a is supplied to the end of adder 26c through amplifier 25a. The output signal of photodetection cel 24b is supplied to the end of 26d of adders through amplifier 25b. The output signal of photodetection cel 24c is supplied to the other end of 26d of adders through amplifier 25c. A photodetection cel 24d output signal is supplied to the other end of adder 26c through amplifier 25d.
[0016] The output signal of adder 26a is supplied to the reversal input edge of the differential amplifier OP2, and the output signal of adder 26b is supplied to the noninverting input edge of the differential amplifier OP2. The differential amplifier OP2 outputs the signal about a focal point according to the difference of both the output signals of Adders 26a and 26b. This output is supplied to the focusing control circuit 27. The output signal of the focusing control circuit 27 is supplied to the focusing drive coil 12. Thereby, the control to which a laser beam always serves as a focus just on an optical disk 1 is made.
[0017] The output signal of adder 26c is supplied to the reversal input edge of the differential amplifier OP1, and the output signal of 26d of adders is supplied to the noninverting input edge of this differential amplifier OP1. The differential amplifier OP1 outputs the truck difference signal according to the difference of both Adders [26c and 26d] output signals. This output is supplied to the tracking control circuit 28. The tracking control circuit 28 creates a truck driving signal according to the truck difference signal from the differential amplifier OP1.
[0018] The truck driving signal outputted from the tracking control circuit 28 is supplied to the drive coil 11 of the direction of tracking. Moreover, the truck difference signal used in the tracking control circuit 28 is supplied to the linear motor control circuit 8.
[0019] By the above-mentioned focusing control and tracking control being made, change of the reflection factor from the bit formed on the truck of an optical disk 1 corresponding to recording information is reflected in the sum signal of an each photodetection cels [of a photodetector 24 / 24a-24d] output signal, i.e., the output signal of adder 26e adding both Adders [26c and 26d] output signals. This signal is supplied to the data regenerative circuit 18. The data regenerative circuit 18 reproduces record data based on the clock signal for playback from the PLL circuit 16.
[0020] When the objective lens 10 is moved by the above-mentioned tracking control circuit 28, a linear motor 6 5, i.e., an optical pickup, is moved by the linear motor control circuit 8 so that an objective lens 10 may be located near the center position in an optical pickup 5.
[0021] The motor control circuit 4, the linear motor control circuit 8, the laser control circuit 15, the PLL circuit 16, the data regenerative circuit 18, the focusing control circuit 27, the tracking control circuit 28, and error correction circuit 32 grade are controlled by CPU30 through a bus 29. CPU30 performs predetermined actuation by the program recorded on memory 2.
[0022] Drawing 2 is drawing which extracts the part related to the 1st operation gestalt of this invention in the optical disk unit of drawing 1 , and is shown in a detail. The data regenerative circuit 18 on the PCB substrate fixed to the pickup 5 which is moving part, and a body is connected by the flexible cable 41.
[0023] A power source (PS) 46 is formed in the data regenerative-circuit 18 side, for example, supplies the supply voltage Vcc of 5V. This supply voltage Vcc is supplied also to pickup 5 through the flexible cable 41. The buffer amplifier 50 generates the reference voltage Vref of 2.1V from supply voltage Vcc, and provides various circuits in pickup with it.
[0024] As mentioned above, in pickup 5, a photodetection cels [24a-24d] current output is transformed into an electrical potential difference by Amplifier 25a-25d, and is added by Adders 26c, 26d, and 26e. The RF-signal output of adder 26e (only henceforth amplifier 26e) which is single output amplifier is supplied to the differential amplifier 44 of the data regenerative circuit 18 through the flexible cable 41.
[0025] Thus, with the 1st operation gestalt, with a single output, when the data regenerative-circuit 18 side of a fixed part is a difference input, it considers like a RF signal that the reference electrical potential difference Vref of pickup 5 is a signal, and the RF-signal output of the pickup 5 which is moving part makes the signal line 55 which tells the reference electrical potential difference Vref

approach the RF signal line 54 extremely, wires parallel, and inputs into the differential amplifier 44 which is an RF amplifier. Furthermore, the reference electrical-potential-difference generating section 50 is formed in pickup 5.

[0026] In the operation gestalt shown in the 1st [this] operation gestalt and the following, by transmitting a reference electrical potential difference as a signal, fluctuation of a reference electrical potential difference can be lost and a high quality signal can be acquired.

[0027] Moreover, since according to the 1st operation gestalt signal lines 54 and 55 approach extremely and it is arranged, the noise Ec mixed in the signal line 54 in the noise Ea mixed in the output-signal line 54 of amplifier 26e of pickup 5, the noise Eb mixed in the signal line 54 in the flexible cable 41, and a PCB substrate is mixed also like the signal line 55 from the reference volt input of amplifier 26e to the reference volt input of the differential amplifier 44. Since these noises are in phase to the differential amplifier 44 and are inputted into it, it negates each other. Therefore, the output of the differential amplifier 44 will serve as A(VRF+Ea+Eb+Ec- (Ea+Eb+Ec)) =AxVRF, if the amplification factor is set to A.

[0028] Drawing 3 shows the circuitry concerning the 2nd operation gestalt of this invention. In addition, in drawing 3 , circuits, such as Amplifier 25a-25d, are omitted in order to simplify explanation. The electrical potential differences V1 and V2 inputted into amplifier 26e are the addition outputs of Adders 26d and 26c (refer to drawing 2).

[0029] With this 2nd operation gestalt, the reference electrical potential difference Vref is generated in the data regenerative-circuit 18 side of a fixed part. The buffer amplifier 51 generates the reference electrical potential difference Vref from supply voltage Vcc, and this reference electrical potential difference Vref is inputted into pickup 5 through the flexible cable 41. The reference electrical potential difference inputted into pickup 5 is supplied to other circuits in pickup 5 while it is supplied to the reference input of amplifier 26e.

[0030] It is considered that the reference electrical potential difference of amplifier 26e is a signal, and it is supplied to the reference volt input of the differential amplifier 44 using signal line 53 with the another reference electrical-potential-difference supply line 52 from the amplifier 51 by the side of a fixed part. This signal line 53 is made to approach the RF signal line 54 extremely, and is wired by parallel.

[0031] Also in this 2nd operation gestalt, since signal lines 53 and 54 are approaching extremely, the noise Ec mixed in the signal line 54 in the noise Ea mixed in the output-signal line 54 of amplifier 26e of pickup 5, the noise Eb mixed in the signal line 54 in the flexible cable 41, and a PCB substrate is mixed also like the signal line 53 from the reference volt input of amplifier 26e to the reference volt input of the differential amplifier 44. Since these noises are in phase to the differential amplifier 44 and are inputted into it, it negates each other. Therefore, the output of the differential amplifier 44 will serve as A(VRF+Ea+Eb+Ec- (Ea+Eb+Ec)) =AxVRF, if the amplification factor is set to A.

[0032] Drawing 4 shows the circuitry concerning the 3rd operation gestalt of this invention. In addition, it is omitted in order that circuits, such as Amplifier 25a-25d, may simplify explanation also in drawing 4 . The electrical potential differences V1 and V2 inputted into amplifier 26e are the addition outputs of Adders 26d and 26c (refer to drawing 2). Moreover, the configuration which generates the reference electrical potential difference Vref, and the configuration which supplies the reference electrical potential difference in pickup 5 are the same as that of the 2nd operation gestalt of drawing 3 R> 3.

[0033] With this 3rd operation gestalt, it considers that GND (touch-down) potential is a signal, and the data regenerative circuit 18 of a fixed part is supplied. That is, the signal line 56 connected to GND of pickup 5 is made to approach extremely RF output signal line 54 of amplifier 26e, parallel are wired, and it connects with the reference volt input of the differential amplifier 44. The reference volt input of amplifier 26e prepared in the pickup 5 side is connected to GND through the bypass capacitor 54.

[0034] Also in this 3rd operation gestalt, since signal lines 54 and 56 approach extremely and it is arranged, the noise Ec mixed in the signal line 54 in the noise Ea mixed in the output-signal line 54 of amplifier 26e of pickup 5, the noise Eb mixed in the signal line 54 in the flexible cable 41, and a PCB substrate is mixed also like the signal line 56 from GND of amplifier 26e to the reference volt input of

the differential amplifier 44. Since these noises are in phase to the differential amplifier 44 and are inputted into it, it negates each other. Therefore, the output of the differential amplifier 44 will serve as A(VRF+Ea+Eb+Ec- (Ea+Eb+Ec)) =AxVRF, if the amplification factor is set to A.

[0035]

[Effect of the Invention] By this invention, by transmitting the reference electrical potential difference of a drive output as a signal in an electronic circuitry with the long transmission line, the potential difference of a reference electrical potential difference can be arranged, and a high quality signal can be acquired. Moreover, since the noise mixed in the reference electrical potential difference of the pickup which is moving part, the noise mixed in a flexible cable, and the noise which jumps into the pattern of PCB which is a fixed part are cancellable, the high RF signal of a S/N ratio can be obtained and the reading engine performance improves.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing 1 is the block diagram showing the configuration of the optical disk unit with which this invention is applied.
[Drawing 2] Drawing 2 is a circuit diagram which extracts the part related to the 1st operation gestalt of this invention in the optical disk unit of drawing 1 , and is shown in a detail.
[Drawing 3] Drawing 3 is drawing showing the circuitry concerning the 2nd operation gestalt of this invention.
[Drawing 4] Drawing 4 is drawing showing the circuitry concerning the 3rd operation gestalt of this invention.
[Drawing 5] Drawing 5 is drawing showing the connection configuration of RF signal input part fixed to the RF signal output part [of the pickup in the conventional optical disk unit], and body side.
[Description of Notations]
1 -- Optical disk
3 -- Motor
10 -- Objective lens
11 12 -- Drive coil
20 -- Collimator lens
21 -- Half prism
22 -- Condenser lens
23 -- Cylindrical lens
24a-24d -- Photodetection cel
25a-25d -- A current / electrical-potential-difference conversion amplifier
26a-26d -- Adder
41 -- Flexible cable
42 -- Fixed part
44 -- Differential amplifier
45, 50, 51 -- Buffer amplifier

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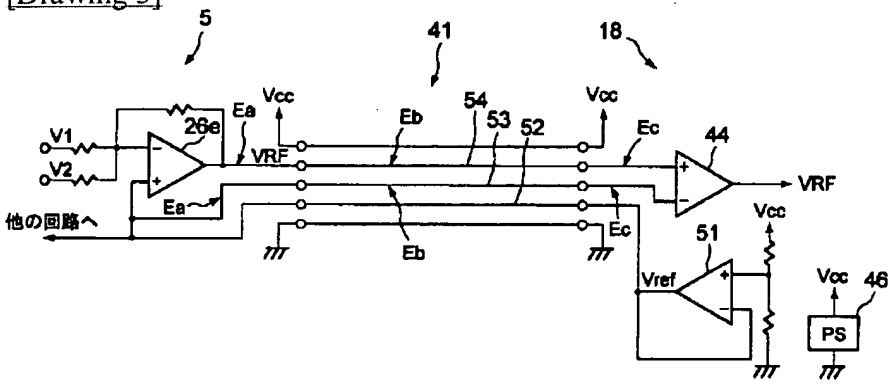
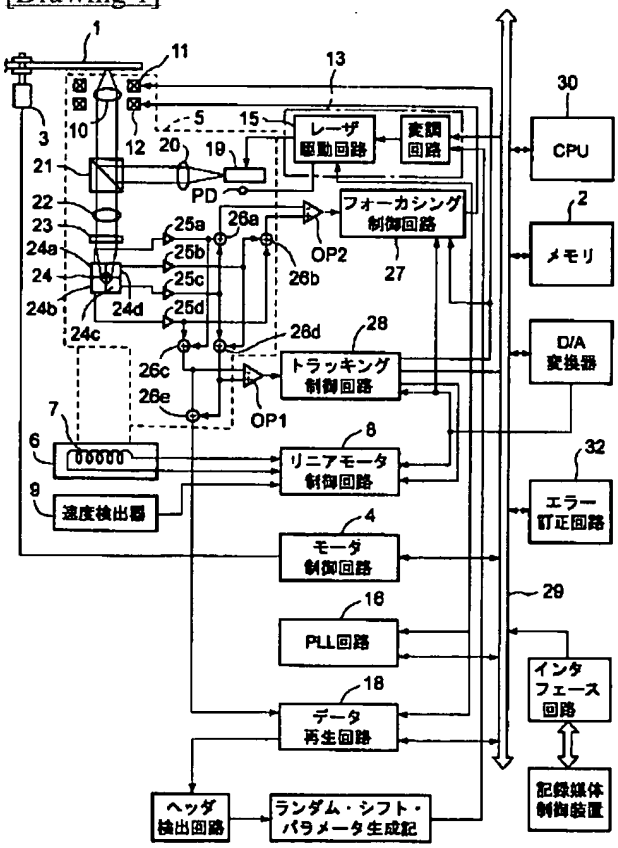
DRAWINGS

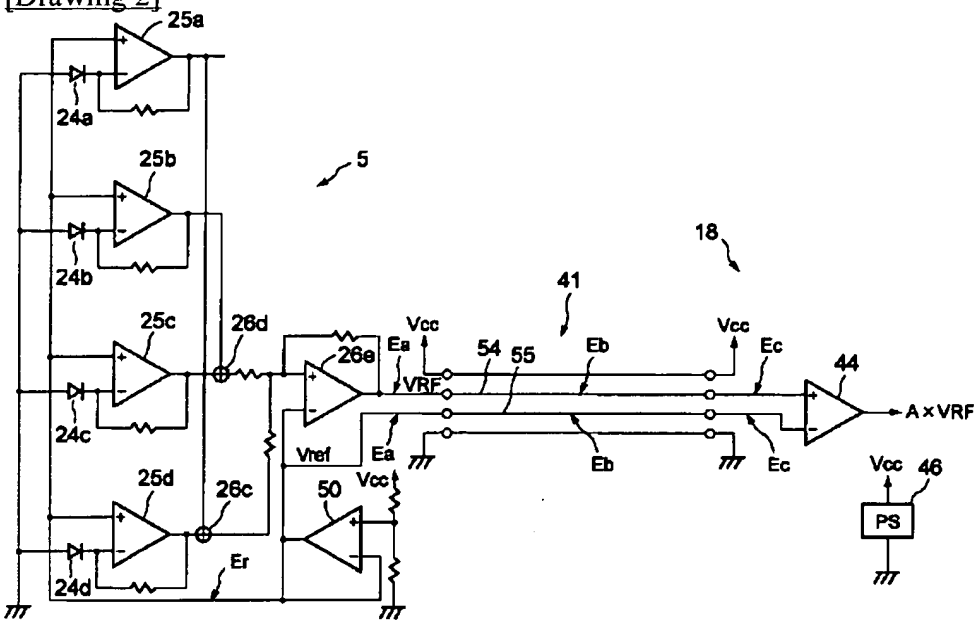
[Drawing 3]



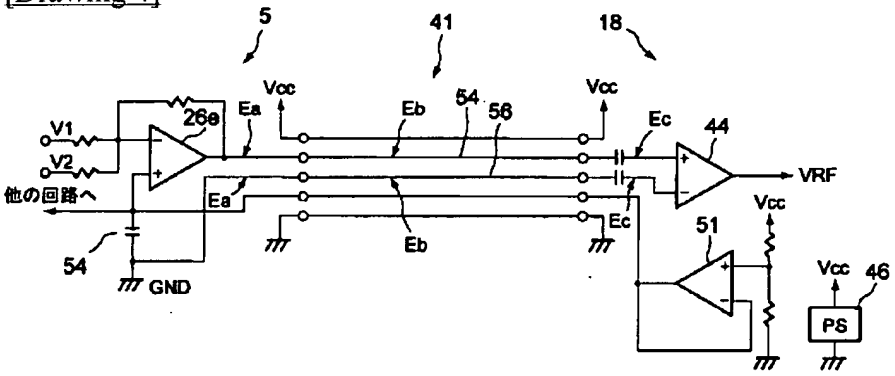
[Drawing 1]



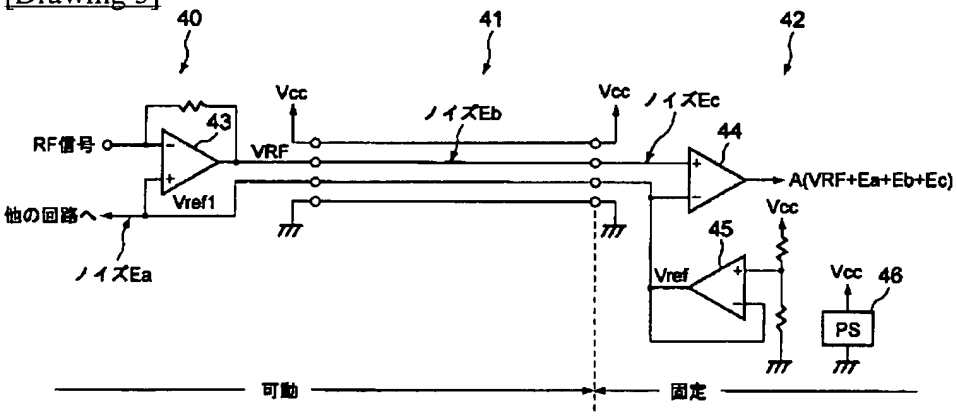
[Drawing 2]



[Drawing 4]



[Drawing 5]



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